Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_

**Unit 1 Test Practice: Evolution, Classification, and Origin of Life**

Ms. Ottolini, AP Biology

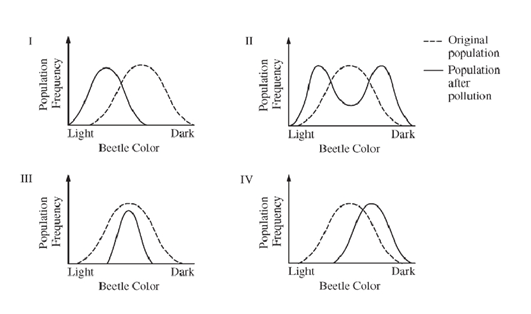
***Directions:*** *Use the questions below (organized by objective) as EXAMPLES of the types of question you will see on your upcoming Unit 1 Test. Not ALL specific learning targets have a corresponding example in this review packet. Please refer to your Unit 1 Map to make sure you have reviewed and mastered ALL the specific learning targets.*

*Note: Each question below is followed by a bolded number corresponding to the objective and a bolded letter corresponding to the specific learning target.*

***Objective #1:*** You will be able to define evolution and describe how natural selection causes evolution based on various sources of evidence.

1. The deer mouse is the most widely distributed small mammal in North America. It varies widely according to its geographical location, especially in coat color, tail length, and foot length. Where would you expect deer mice to be relatively uniform? **(1.b)**  
   (A) In mountainous areas, where environmental conditions change dramatically from place to place.  
   (B) Across an island chain including islands with very different environmental conditions  
   (C) Over large areas where there is little topographical or vegetational change.  
   (D) In regions between forests and deserts, where there is significant vegetational change.

In a hypothetical population of beetles, there is a wide variety of color, matching the range of coloration of the tree trunks on which the beetles hide from predators. The graphs below illustrate four possible changes to the beetle population as a result of a change in the environment due to pollution that darkened the tree trunks.

1. Which of the following includes the most likely change in the coloration of the beetle population after pollution and a correct rationale for the change? **(1.b, 1.e)**  
   (A) The coloration range shifted toward more light-colored beetles, as in diagram I. The pollution helped the predators find the darkened tree trunks.  
   (B) The coloration in the population split into two extremes, as in diagram II. Both the lighter-colored and the darker-colored beetles were able to hide on the darker tree trunks.  
   (C) The coloration range became narrower, as in diagram III. The predators selected beetles at the color extremes.  
   (D) The coloration in the population shifted toward more darker-colored beetles, as in diagram IV. The lighter-colored beetles were found more easily by the predators than were the darker- colored beetles.

Guppies are small fish found in streams in Venezuela. Male guppies are brightly colored, with black, red, blue and iridescent (reflective) spots. Males cannot be too brightly colored or they will be seen and consumed by predators, but if they are too plain, females will choose other males. Natural selection and sexual selection push in opposite directions. When a guppy population lives in a stream in the absence of predators, the proportion of males that are bright and flashy increases in the population. If a few aggressive predators are added to the same stream, the proportion of brightly-colored males decreases with about 5 months (3-4 generations). The effects of predators on guppy coloration have been studied in artificial ponds with mild, aggressive, and no predators, and by similar manipulations of predators in natural stream environments (Endler, 1980). For each of the following questions, choose the one answer that best reflects how an evolutionary biologist would answer.

1. Fitness is a term often used by biologists to explain the evolutionary success of certain organisms. Which feature would a biologist consider to be most important in determining which guppies re “most fit?” **(1.b)**  
   (A) Large body size and ability to swim quickly away from predators.  
   (B) Excellent ability to compete for food.  
   (C) High number of offspring that survive to reproductive age.  
   (D) High number of matings with many different females.
2. Humans impact variation in other species which results in changes in allelic frequencies. These changes can lead to a shift in phenotypes to one extreme, as in the pepper moth population. The cause of this shift in phenotype is: **(1.e)**
   1. directional selection
   2. stabilizing selection
   3. disruptive selection
   4. sexual selection
3. A species of malaria-carrying mosquito lives in a forest in which two species of monkeys, A and B, coexist. Species A is immune to malaria but species B is not. The malaria-carrying mosquito is the chief food for a particular kind of bird in the forest. If all of these birds are eliminated suddenly by hunters, which of the following would be the immediate observable consequence? **(1.b)**

a) Increased mortality in monkey species A

b) Increased mortality in monkey species B

c) Increased mortality in the malaria-carrying mosquitoes

d) Emergence of malaria-resistant strains in monkey species B

1. The introduction of antibiotics such as penicillin several years ago was immediately effective in combating infections caused by Staphylococcus. In 1958, however, there were several outbreaks of staphylococcal infections. People with the infections did not respond to treatment with any of the antibiotics and there was a large number of deaths. The best explanation for this situation is that **(1.b)**

(a) the bacteria from other hosts such as birds, cats, and dogs migrated into human hosts

(b) the bacteria exposed to nonlethal doses of antibiotics quickly learned to avoid them

(c) each generation of bacteria acquired the ability to use antibiotics as nutrients

(d) antibiotic-resistant bacteria survived and multiplied, and these were the forms causing the infections

***Objective #2:*** You will be able to describe the conditions that must be met for a population to stop evolving, and use equations to predict current and future allele, genotype, and phenotype frequencies in the population.

1. Over time, the movement of people on Earth has steadily increased. This has altered the course of human evolution by increasing **(2.a)**

A) nonrandom mating.

B) geographic isolation.

C) genetic drift.

D) gene flow.

1. Genetic drift is likely to be seen in a population: **(2.a)**

A) That has a high migration rate.

B) That has a low mutation rate.

C) In which natural selection is occurring.

D) That is very small.

E) For which environmental conditions are changing.

1. The Hardy-Weinberg formula is used to estimate the frequency of carriers of alleles that cause genetic disorders and traits. In considering the Hardy-Weinberg equilibrium equation **(2.c)**

(A) p represents the number of dominant individuals

(B) q represents the number of recessive individuals

(C) p² + 2pq represents the percent of individuals expressing the dominant phenotype.

(D) q² represents the number of recessive alleles.

1. In a Hardy-Weinberg population with two alleles, *A* and *a*, that are in equilibrium, the frequency of allele *a* is 0.2. What is the frequency of the heterozygous genotype in this population? Express your answer as a decimal. **(2.c)**

Answer: \_\_\_\_\_\_\_\_\_\_\_\_\_

1. In a Hardy-Weinberg population with two alleles, *A* and *a*, that are in equilibrium, the frequency of the allele *a* is 0.3. What is the frequency of the dominant phenotype in this population? Express your answer as a decimal. **(2.c)**

Answer: \_\_\_\_\_\_\_\_\_\_\_\_\_

1. In peas, a gene controls flower color such that *R* = purple and *r* = white. In an isolated pea patch, there are 36 purple-flowering plants and 64 white-flowering plants. Assuming Hardy-Weinberg equilibrium, what is the value of *q* for this population? Express your answer as a decimal. **(2.c)**

Answer: \_\_\_\_\_\_\_\_\_\_\_\_\_

***Objective #3:*** You will be able to interpret evidence indicating speciation and extinction events throughout Earth’s history and identify potential causes for speciation in a population.

1. Trout in stream A and trout in stream B look similar, but not quite identical. Scientists were unsure if they were two populations of one fish species, or two separate species. To figure this out, they studied the life cycle, habitat, and reproduction of the trout. In a year with a typical amount of rainfall, the trout stay within their own stream and mate with individuals that live nearby. However, in years that include excessive rainfall and flooding, the fish are washed downstream to a larger river, and must swim back up into either stream A or stream B. They choose which stream to swim up randomly, often ending up in a different location than where they themselves were born. When a trout that originated from stream A does breed with a trout from stream B, their offspring are healthy and show no decrease in fertility. Scientists think that flooding in this watershed is happening more and more frequently, due to global climate change. Given this information, predict what is the most likely result for trout A and trout B. **(3.a)**  
   (A) they will become reproductive isolated from each other  
   (B) they will become more similar in their gene pools  
   (C) they will go through random changes due to genetic drift  
   (D) they will adapt to different conditions and look more and more different

Populations of a plant species have been found growing in the mountains at altitudes above 2,500 meters. Populations of a plant that appears similar, with slight differences, have been found in the same mountains at altitudes below 2,300 meters.

1. Which of the following describe TWO kinds of data that could be collected to provide a direct answer to the question, do the populations growing above 2,500 meters and the populations growing below 2,300 meters represent a single species? **(3.a)**

(A) Rate of hybrid death, rate of hybrid success

(B) Number of differences between the species and the rate of reproductive success

(C) Rate of successful interbreeding between the populations, occurrence of hybrid fertility

(D) Ability of upper plant species to grow in the altitudes below 2,300 meters, and length of life of hybrids

1. Imagine a scenario in which part of a population of South American finches is blown by a storm onto an island far offshore and manages to survive and reproduce there for a period of 10,000 years. After that period, a climate change results in lower sea levels and the reconnection of the island with the mainland. Members of the formerly isolated island finch population can now interact freely with members of the original mainland population. Which of the following observations would, by itself, lead you to conclude unequivocally that the island finch population had evolved into a distinct species? **(3.a)**

A) The island birds all have red feathers, but the mainland birds have green feathers.

B) Individuals from the different populations sometimes mate with each other, but all of the resulting eggs are sterile.

C) The preferred food of the island birds is quite different from the diet of mainland birds.

D) Individuals from the different populations frequently direct courtship behavior toward members of the other population.

E) Hybrid offspring of matings between individuals from the two populations do not look like either parent.

1. Three species of frogs-- *Rana pipiens*, *Rana clamitans*, and *Rana sylvatica*— all mate in the same ponds, but they pair off correctly because they have different calls. This is a specific example of a \_\_\_\_\_\_ barrier, called \_\_\_\_\_. **(3.a)**

A) prezygotic… behavioral isolation

B) postzygotic… hybrid breakdown

C) prezygotic… temporal isolation

D) postzygotic… mechanical isolation

1. Which of the following is descriptive of the punctuated equilibrium model? **(3.c)**

A) Long periods of stasis are punctuated by episodes of relatively rapid speciation and change.

B) Microevolution is the driving force of speciation.

C) Evolution occurs gradually as the environment gradually changes.

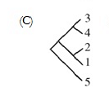
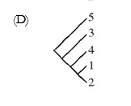
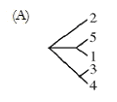
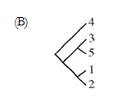
E) In the framework of geologic time periods, speciation events occur very slowly and the equilibrium of species is punctuated by frequent extinctions

***Objective #4:*** You will be able to analyze and create phylogenetic trees and cladograms to determine relatedness between groups of organisms.

Five new species of bacteria were discovered in Antarctic ice core samples. The nucleotide (base) sequences of rRNA subunits were determined for the new species. The table below shows the number of nucleotide differences between the species.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Species | 1 | 2 | 3 | 4 | 5 |
| 1 | - | 3 | 19 | 18 | 27 |
| 2 |  | - | 19 | 18 | 26 |
| 3 |  |  | - | 1 | 27 |
| 4 |  |  |  | - | 27 |

1. Which of the following phylogenetic trees is the most consistent with the data above? **(4.e)**



1. Experimental evidence shows that the process of glycolysis (a step in cellular respiration) is present and virtually identical in organisms from all three domains, Archaea, Bacteria, and Eukarya. Which of the following hypotheses could be best supported by this evidence? **(4.c)**

(A) All organisms carry out glycolysis in mitochondria.  
(B) Glycolysis is a universal energy-releasing process and therefore suggests a common ancestor for all forms of life.  
(C) Across the three domains, all organisms depend solely on the process of anaerobic respiration for ATP production.  
(D) The presence of glycolysis as an energy-releasing process in all organisms suggests that convergent evolution occurred.

1. Which of the following describes the characteristics of the universal ancestor. **(4.c)**

(A) anaerobic, unicellular, heterotrophic

(B) Unicellular, eukaryotic, terresterial

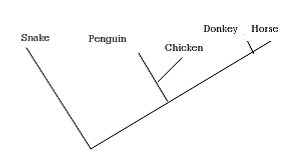
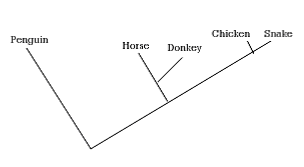
(C) sexual, unicellular, autotrophic

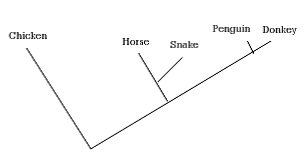
(D) asexual, nonmetabolic, small

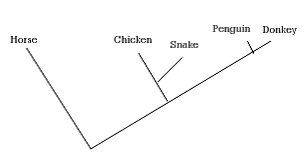
THE NUMBER OF AMINO ACID DIFFERENCES IN CYTOCHROME *c* AMONG VARIOUS ORGANISMS

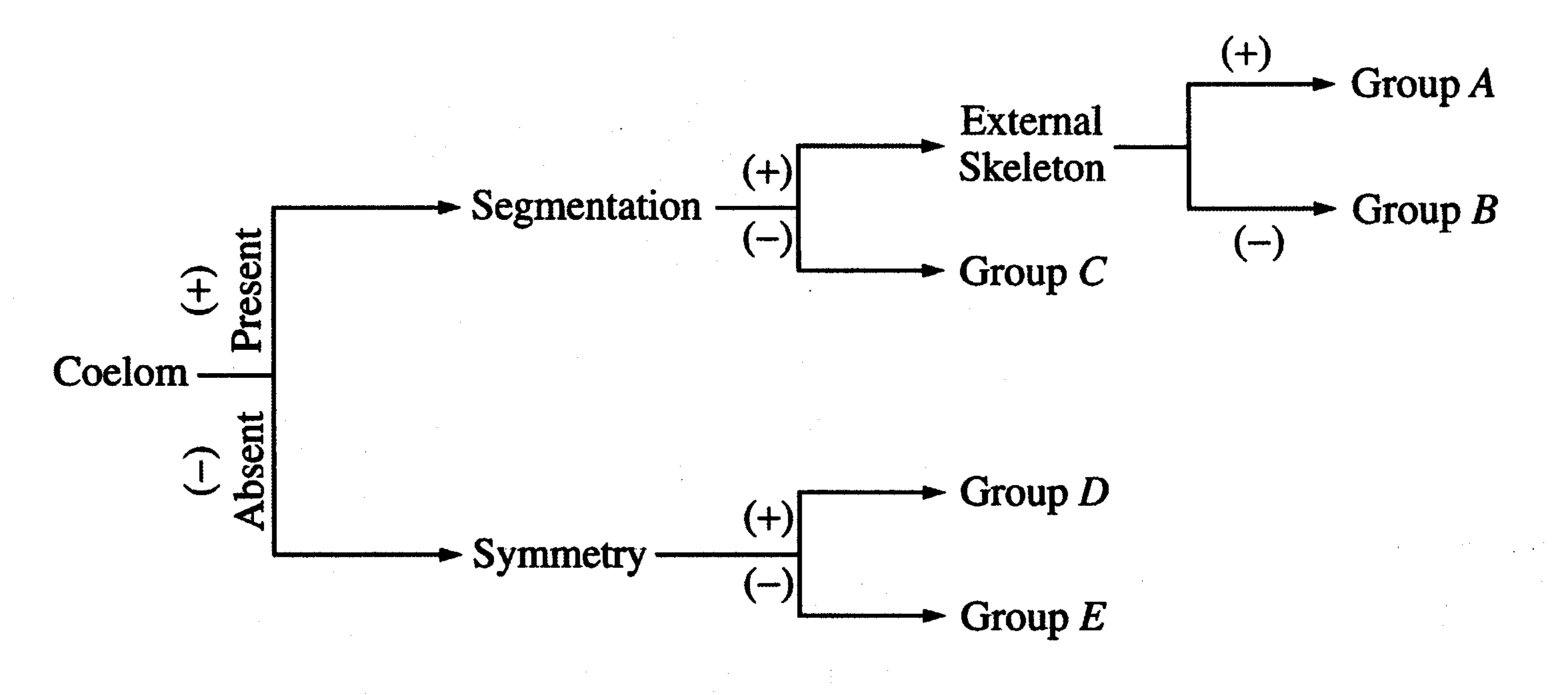
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Horse | Donkey | Chicken | Pengiun | Snake |
| Horse | 0 | 1 | 11 | 13 | 21 |
| Donkey |  | 0 | 10 | 12 | 20 |
| Chicken |  |  | 0 | 3 | 18 |
| Penguin |  |  |  | 0 | 17 |
| Snake |  |  |  |  | 0 |

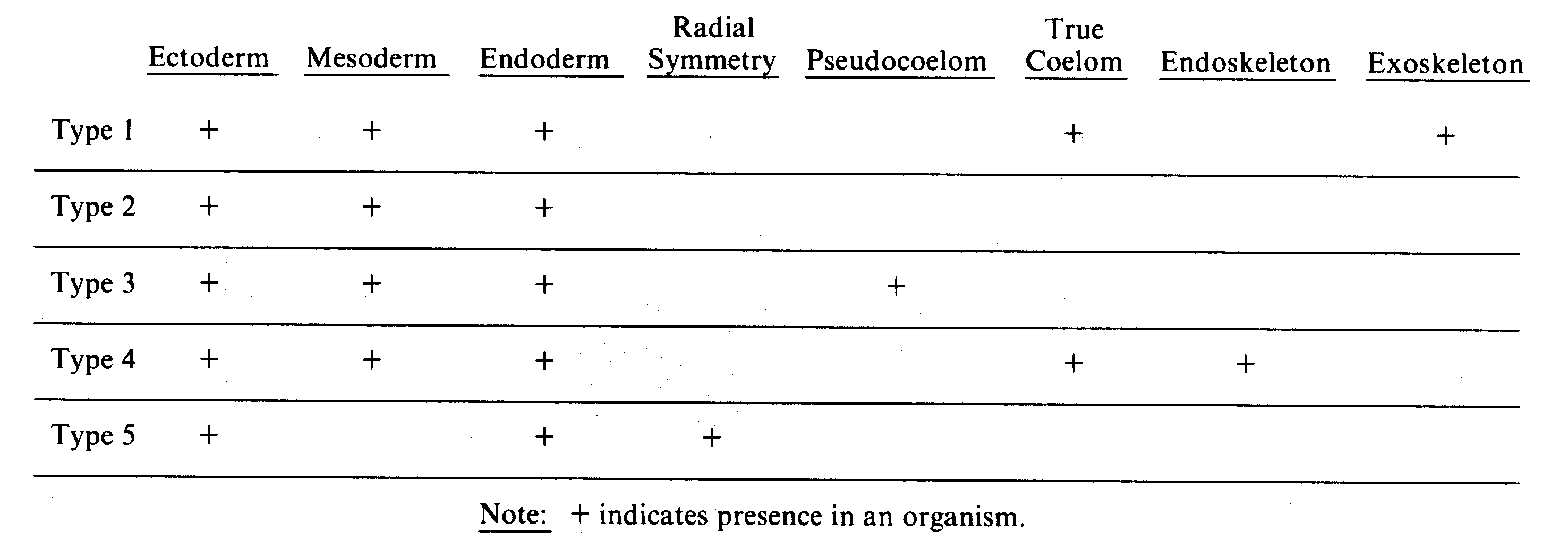
1. Which of the following phylogenic tree can be made based on the data above:

(A)(B)

(D)  
(C)





1. Centipedes and millipedes should NOT be placed in group *B* because they **(4.d)**
   1. have an exoskeleton
   2. display segmentation
   3. have a coelom
   4. are heterotrophic
2.  The most conserved trait in the chart is **(4.e)**

(A) Mesoderm

(B) Ectoderm

(C) Radial Symmetry

(D) Coelom

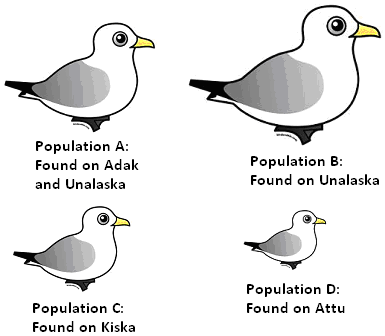
1. Of these organisms which two are most closely related **(4.e)**

(A) 1 + 3

(B) 2 + 1

(C) 3 + 4

(D) 4 + 1



The Aleutian Islands form an island chain off the coast of Alaska. The islands are exposed to heavy rainfall and almost always are impaired by fog. They are covered with dense herbage and shrubs. Many of the islands are inhabited by large colonies of seabirds. Several of these populations of seabirds are shown in the image above.

The DNA information below comes from four different populations of seabirds found in the Aleutian Islands.

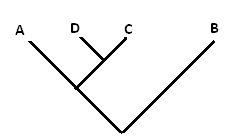
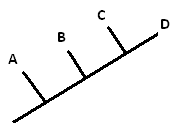
Population A: A T G T A T C T G G A A T C C A T G A C G T A A G C T T A G A G A C T

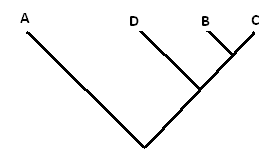
Population B: T - C - T - G - - A - - - G - T - - G - - - T - - - A - - T - - C - -

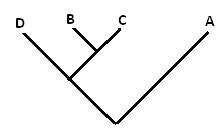
Population C: T - C - - - G - - - - - - G - T - - G - - - T - - - - - - T - - C - -

Population D: T - - - T - G - - - - - - - - T - - G - - - T - - - - C - - - - C - -

Use the phylogenetic trees below to answer Questions 25 and 26.

 a. b.





c. d.

1. If a phylogenetic tree were created for the four populations of seabird based on anatomical structure and geographic distance, which tree would be the best choice? **(4.e)**

(A) Tree A        (B) Tree B (c) Tree C (D) Tree D

1. If a phylogenetic tree were created for the four populations of seabird based on DNA, which tree would be the best choice? **(4.e)**

(A) Tree A        (B) Tree B (c) Tree C (D) Tree D

***Objective #5:*** You will be able to describe the current hypotheses regarding the origin and history of living organisms and evaluate their validity based on observational and experimental evidence.

1. By discharging electric sparks into a laboratory chamber atmosphere that consisted of water vapor, hydrogen gas, methane, and ammonia, Stanley Miller obtained data that showed that a number of organic molecules, including many amino acids, could be synthesized. Miller was attempting to model early Earth conditions as understood in the 1950s. The results of Miller's experiments best support which of the following hypotheses? **(5.a)**  
   (A) The molecules essential to life today did not exist at the time Earth was first formed.  
   (B) The molecules essential to life today could not have been carried to the primordial Earth by a comet or meteorite.  
   (C) The molecules essential to life today could have formed under early Earth conditions.  
   (D) The molecules essential to life today were initially self-replicating proteins that were synthesized approximately four billion years ago.

36.

1. According to the scientific theory of the origin of life on earth, life arose spontaneously from inanimate chemicals. Do scientists think this process is still occurring on our planet today? **(5.a)**

(a) yes, it probably is

(b) no, because conditions on earth have changed and are no longer conducive to spontaneous evolution of life

(c) Yes, they have proven it in lab conditions

(d) no, because we no longer have the inanimate chemicals present

1. Once a protocell was capable of reproduction, it became a true cell and \_\_\_\_\_\_\_\_\_\_ would have begun. **(5.b, 5.e)**

(A) photosynthesis and the buildup of an atmosphere

#### (B) biological evolution

(C) aerobic respiration

(D )the geological time scale

1. Why do some scientists believe that RNA, rather than DNA, was the first genetic material? **(5.c)**
2. RNA probably mutated into DNA.
3. RNA has both information storage and catalytic properties.
4. RNA can replicate more accurately than DNA.
5. RNA contains uracil in place of thymine.